Good Work Practice Bulletin

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Title: ALARA Protective Measures Applied During Sludge Treatment Reduce Potential Dose Rate

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Lessons Learned Summary: Implementation of ALARA Protective measures during sludge treatment process at T Plant eliminated an estimated dose of 27-30 person-rem.

Discussion of Activities: In preparation for shipment of radioactive sludge to the Waste Isolation Pilot Plant (WIPP), sludge was pumped from Large Diameter Containers (LDCs) into a buffer tank. Metered quantities were then pumped into 55 gallon drums, grouted and temporarily stored until shipment to WIPP. The sludge contained significant amounts of Cs137 and Sr90 as well as alpha emitters such as Pu239 and Am241. Dose rates on the LDCs exceeded 1000 mrem/h. The characteristics of the sludge are such that as the sludge dried out, it produced considerable airborne and surface contamination. ALARA Protective measures were implemented to reduce dose to workers and reduce the potential for spread of contamination and airborne radioactivity including shielding, remote handling, remote monitoring, automated handling, confinement ventilation, pre-staging, secondary containment, special tools, system walk downs, mock-ups and dry runs.

Lead shielding was attached to the outside of the LDC and a 4" thick steel shield covered the buffer tank. In addition, a 2" thick steel shield was mounted in front of the mixing enclosure to reduce the worker's dose but allow access when needed. This shielding was installed during assembly of the components in areas that were not radiation areas. A crane was used to install the LDC into a overpack. The crane is located behind a 5' thick concrete parapet wall. All pumps, valves, mixing motors, etc are operated remotely from one of two control panels. Closed circuit TV cameras were used by workers to monitor tank levels and the work steps. A mini-camera was mounted to an extension pole and lowered into the LDC to monitor inside during pumping activities. Other cameras were used by waste services personnel to monitor drum weights, verify containers are empty, and observe the entire process from a control room. Radiation levels on the sludge during the mixing process were also monitored remotely.

An automated positioning device was used to position the 55 gallon drums in the exact location for filling. Automated pumping controls were used to pump sludge and water to the 55 gallon drums. Three HEPA filtered portable ventilation units were used to provide negative ventilation on all of the confinement enclosures. As a time saving measure, absorbent material was loaded into "pillows" and placed in the headspace of each drum to absorb excess liquid, rather than shoveling absorbent into the top of the drum. Grout was pre-packaged in drums and placed near the equipment to reduce the preparation time in radiation areas.

An extension wand was used to pump sludge out of the LDC to increase the distance workers had to be from the equipment. A strain relief cable was attached to make the wand easier to operate with the extension handles. Secondary containments were erected around each of the

system components and piping to confine contamination spread, if a leak occurred. A special tool was developed to reduce the time required to install a drum lid ring to secure the drum. Another tool was used to lift and tilt the drum for dry grout addition steps. An air operated vibrator was attached to the dry grout addition hose to decrease the time required to add dry grout to the drum. All equipment was assembled, tested and dry runs were conducted outside radiation areas at the fabrication shop. System walk downs at the fabrication shop were used to train personnel and capture their best ideas on how to make the process more efficient. Mockups were constructed to provide realistic training for operators and support personnel. Once installed at T Plant, dry-runs of the equipment were conducted prior to introducing contaminated material into the system.

Analysis: The radiological dose, estimated to be 27-30 person-rem, was avoided due to the implementation of these ALARA Protective measures.

Recommendations: None

Cost Savings/Avoidance: ~$200,000 to ~$400,000 or a cost of ~$10,000 per person-rem.

Work Function: Radiation Protection

Hazards: Personal Injury / Exposure - Radiation Contamination

Keywords: ALARA, contamination control, sludge

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